

## **SUMMARY MODULE**

Now that you have completed the EMS course, this summary will review the major modeling and simulation concepts that you should be familiar with.

### **THE ESSENTIALS**

M&S is still an evolving field. It has a rich history, but that history is still being written. New capabilities and applications are being discovered every day. The expectations for M&S will continue to change as technology does. Modeling and simulation is important. It increases efficiency, raises effectiveness and lowers risk. M&S has become so pervasive in our society that our current lifestyle would be drastically different if we did not have M&S.

No one knows it all. Modeling and simulation is a team effort, with many different and valuable roles that are necessary to ensure the success of the project. Every role, including the one you may play on future projects, requires specific skills and expertise and is important to achieve the desired end result. It is essential that each team member learn to value and depend upon the unique contribution that each person brings to the M&S project.

Modeling and simulation development is a systematic and iterative process. All inputs throughout the process have *the potential* to affect the validity of the model or simulation. This process has discernable steps, which cannot be skipped. In the M&S process, everyone must keep the end goal in mind...from the start to the finish of the project. When defining the project, the end-goal can and should help determine the appropriate “tradeoffs” necessary for success.

## **Essentials of Modeling and Simulation Summary Module**

There are many definitions and terms in the M&S field. Many of these terms should be considered as “shades of gray” since they are still being defined while at the same time their use is often being expanded. The importance is to understand a term’s potential for varied meaning so that in your role, you can make good decisions.

And finally, it is important to remember that you can’t model everything. The model has to support the goal.

### **QUESTIONS**

Now that you have seen the breadth and complexity of the field of M&S, you should return to your job with an appreciation of the challenges you will face and the M&S tools available to meet those challenges. The following are a set of basic questions you should ask yourself and your team during the development of any model or simulation. The end-user of a model or simulation should also ask similar questions to determine if the product meets his or her requirements.

#### **For M&S Need Identification**

Is the end-user involved?

Are there plans to involve the end-user throughout the development process?

Does the end-user understand the challenge?

Has the end-user articulated the specific purpose for the final product?

Are the end-user’s expectations realistic?

What is the purpose of the model and simulation?

Are there plans to validate throughout the entire development process?

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**For M&S Requirements Analysis**

Is the end-user involved?

Have we clearly articulated the purpose of the model and simulation?

Is the expertise of development team members appropriate for the purpose of the final product?

Have we fallen in love with an existing model or simulation that doesn't meet our needs?

Has a thorough search been conducted to determine if an existing model or simulation can meet the need or be modified to meet the need?

Is the simulation stand-alone or will it be networked with other simulations?

Have the physical and functional fidelity requirements been determined for all subsystems of the simulation?

**M&S Research & Development**

Is the end-user involved?

Was the model/simulation validated throughout previous phases?

Is validation continuing during this phase?

Have alternative approaches been narrowed to a manageable set?

Are we using the end purpose to help us decide between tradeoffs?

Is the model separable from the simulation?

Are the physical and functional fidelity characteristics appropriate for the end-user's needs?

Does the end-user understand the capabilities of the simulation?

Have the end-user's expectations been managed?

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Are we going into production too quickly?

**M&S Production**

Is the end-user involved?

Was the model/simulation validated throughout previous phases?

Is validation continuing during this phase?

Have we managed the end-user's expectations?

Does the end-user trust the model and simulation?

Has end-user training begun?

**M&S Implementation:**

Is the end-user involved?

Have the end-users been trained?

Was the model or simulation validated throughout previous phases?

Have we managed the end-user's expectations?

Does the end-user trust the model and simulation?

Does the final product meet the needs of the end-user? The answer to this question will always be "not completely," which will often result in the beginning of a new development cycle to determine new needs and new requirements.

**Essentials of Modeling and Simulation  
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Congratulations on completing Essentials of Modeling and Simulation! You should now have an understanding of the field's core concepts and an appreciation for its current issues and future opportunities. And no matter what your role may be in the field of modeling and simulation, you should now be familiar with several guidelines for managing common challenges facing the field of M&S.

In recognition for completing this course, here's a helpful tool you can use to ensure that your M&S projects are successful in realizing their end-goals. [Click here](#) to print out the EMS Course Handout. As you will see, it contains the Process Diagram as well as the Guiding Questions for each development phase. Remember these questions are ones that should be used not only by production teams as they build M&S applications, but also by end-users to determine if the product meets his or her requirements.

Good luck in shaping the future of M&S...